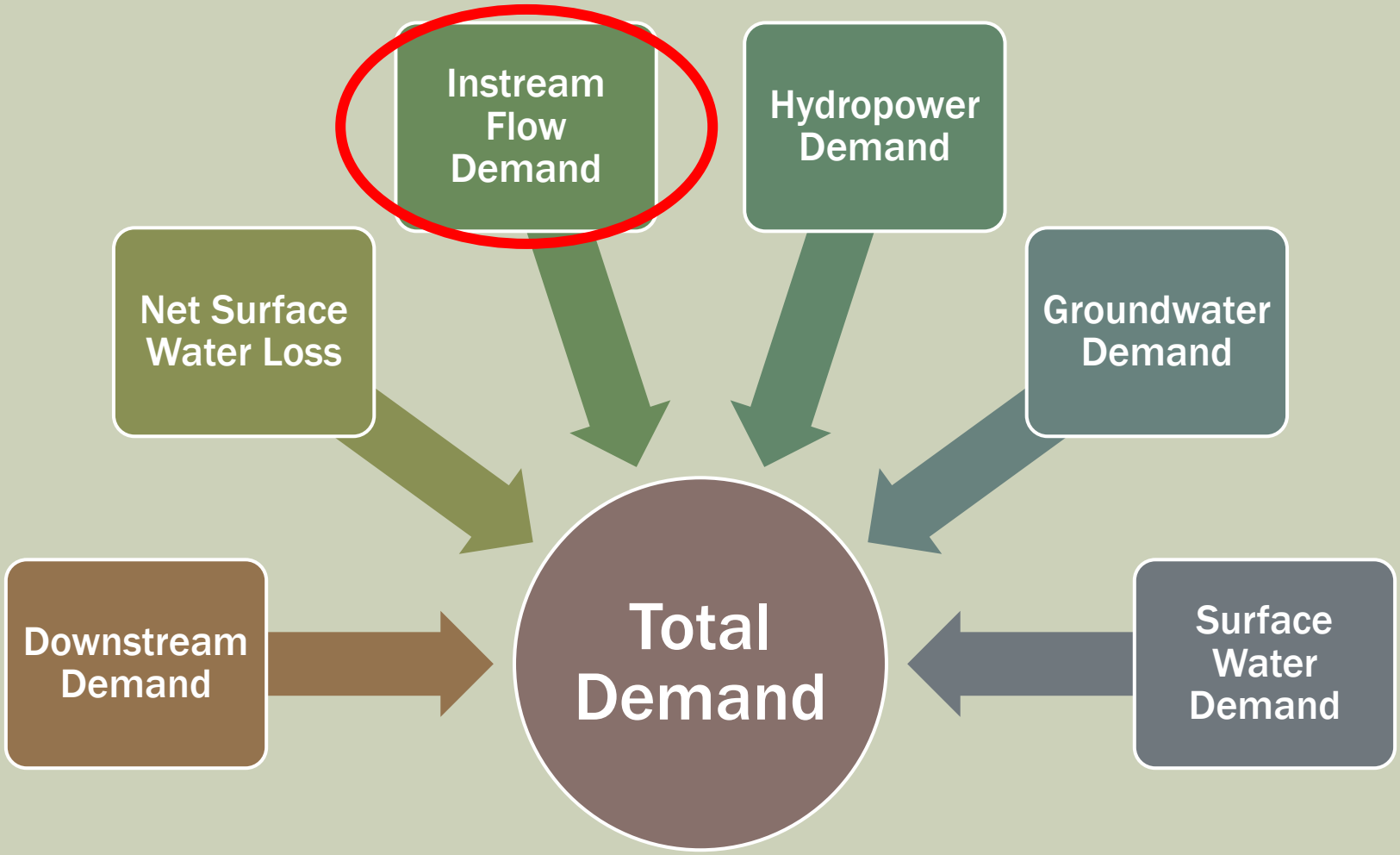
INSTREAM FLOW DEMAND

A Component of Total Demand as Calculated for INSIGHT


Instream Flow Demand
Hydropower Demand
Net Surface Water Loss
Groundwater Demand
Downstream Demand
Total Demand
Surface Water Demand

CONCEPT

- Flows for fish, wildlife, and/or recreation
- Can be held by NE Game and Parks Commission or NRDs
- Non-consumptive demand
  - Supplies available for other non-consumptive demands (i.e. hydropower) can also be used to meet instream flow demands
    - Loup River Basin
- Evaluated instream flow demand in Lower Platte Basin
  - North Bend and Louisville gages
  - NPGC and Central Platte NRD both hold rights in Upper Platte but only NPGC below Duncan gage


http://www.planetofbirds.com


http://www.fws.gov


http://www.tulsaaudubon.org/leastterns.htm


http://en.wikipedia.org/wiki/Pallid_sturgeon

MONTHLY TARGET TOTAL INSTREAM FLOW NEEDS

Based on multiple and overlapping permits

Total Platte River Instream Flow Needs
For Purposes of Water Administration
All Quantities in CFS

Central Platte figures in blue (Priority date of 7-25-1990)
Game & Parks figures in red (Priority date of 11-30-1993)
Totals in black

TIME PERIOD	OVERTON GAGE	ODESSA GAGE	GRAND ISLAND GAGE	DUNCAN GAGE	NORTH BEND GAGE	LOUISVILLE GAGE
January	500	500	500	500	1,800	3,100
February	500	500	500	500	1,800	3,700
March	1,100	1,100	1,100	500	1,800	3,700
April 1-14	1,300	1,350 (1,300 + 50)	1,350 (1,300 + 50)	500	1,800	3,700
April 15-30	1,500	1,500	1,500	500	1,800	3,700
May 1-3	1,500	1,500	1,500	500	1,800	3,700
May 4-10	500	1,350 (includes 500)	1,350 (includes 500)	500	1,800	3,700
May 11-31	500	500	500	500	1,800	3,700
June 1-23	500	1,000 (500 + 500)	1,000 (500 + 500)	1,000 (500 + 500)	1,800	3,700
June 24-30	600	1,000 (600 + 400)	1,000 (600 + 400)	1,000 (600 + 400)	1,800	3,700
July 1-31	600	1,000 (600 + 400)	1,000 (600 + 400)	1,000 (600 + 400)	1,800	3,700
August 1-22	600	800 (600 + 200)	800 (600 + 200)	900 (600 + 300)	1,800	3,500
August 23-31	500	800 (500 + 300)	800 (500 + 300)	900 (500 + 400)	1,800	3,500
September	500	500	500	500	1,800	3,200
October 1-11	1,100	1,350 (includes 1,100)	1,350 (includes 1,100)	500	1,800	3,700
October 12-31	1,500	1,500	1,500	500	1,800	3,700
November 1-10	1,500	1,500	1,500	500	1,800	3,700
November 11-30	500	500	500	500	1,800	3,700
December	500	500	500	500	1,800	3,700

INSTREAM FLOW DEMAND COMPONENTS

- Four components went into the calculation of instream flow demand:
  - Streamflow
  - Groundwater Depletions
  - Basin water supply contributions
  - Groundwater consumptive use

http://www.bbc.com/travel/

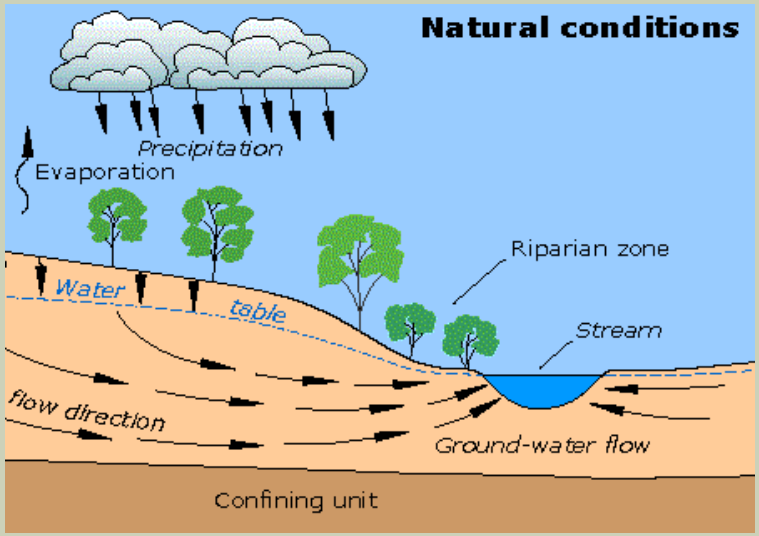
START WITH STREAMFLOW

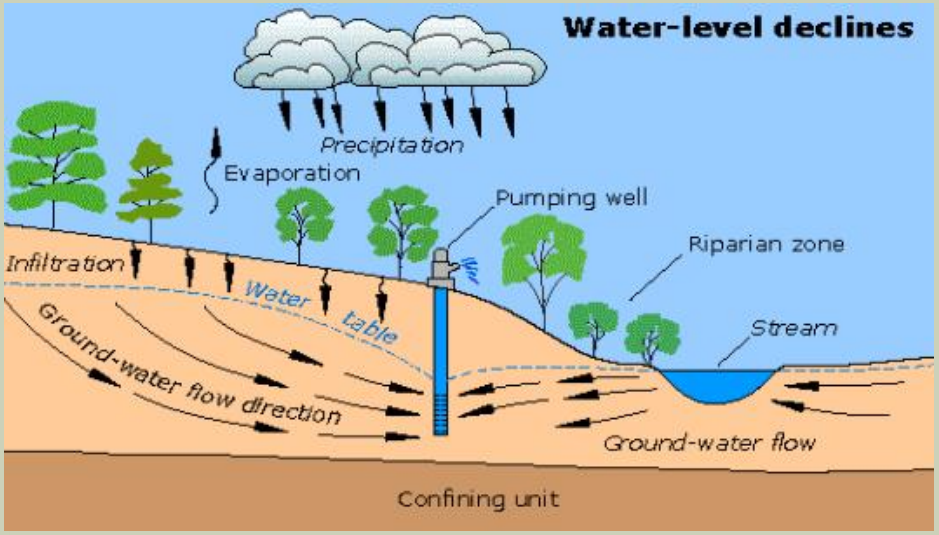
- Records downloaded from USGS or DNR data sites
  - Platte River at North Bend
  - Platte River at Louisville
- Daily data in cubic feet per second (cfs)
- Not capped or altered from gage records at this point

http://journalstar.com/news/local

ADD GROUNDWATER DEPLETIONS

- Calculate undepleted streamflow by adding daily groundwater depletions to daily flow
  - Flow that would be available for instream flow if not for pumping impacts
  - Similar to BWS calculation but don't add SWCU because need to consider priority of right as well
- Estimate daily depletions – divide by number of days in month





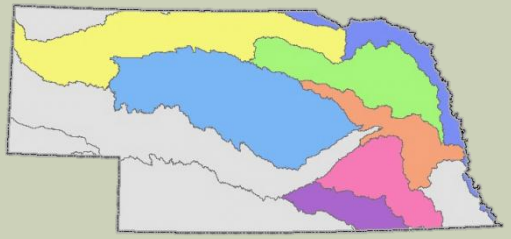
water.usgs.gov

CAP AT DAILY APPROPRIATED RIGHT

- Generate daily permit caps based on monthly table
- If undepleted streamflow is greater than the right, the demand is “capped” at the right
  - Demand cannot exceed what is legally permitted
- If undepleted streamflow does not meet the right, then the undepleted flow is considered the demand
  - Cannot generate more water in the stream to make up the portion of demand not met. Have already added GW depletions and SW priority of use is accounted for so the lack of flow is a natural factor
- Sum capped values to season

PROPORTION DEMAND TO BASINS

- Based on basins' contribution to total BWS at point of the appropriation
- For the Platte River Basin, the Upper Platte, Lower Platte, Loup, and Elkhorn all contribute to total BWS
- Example
  - Total BWS for Platte River is 1,000,000 cfs
    - Upper Platte BWS = 200,000 cfs Proportion = 20%
    - Loup BWS = 400,000 cfs Proportion = 40%
    - Elkhorn BWS = 250,000 cfs Proportion = 25%
    - Lower Platte BWS = 150,000 cfs Proportion = 15%
- Multiply proportion by capped seasonal demand to assign proportionate demands to each basin



SUBTRACT GROUNDWATER CONSUMPTIVE USE

- Need to consider level of development at the time the right was granted – amount of groundwater irrigated acres in 1993
- Used crop mix from irrigated acres dataset for 1993.
- Multiplied by NIR values for 1988 to 2012 to get GWCU
  - NIR changes over time, but number of crop acres remains the same
  - For 10/50 area
- Sum GWCU by season and basin
- Subtracted basin totals from proportionate basin demand to get final instream flow demand
  - Any negative results set to zero

http://shop.michaelforsberg.com

FINAL INSTREAM FLOW DEMANDS

- For Lower Platte Basin, it's proportionate demand is the "instream flow demand"
- Loup Basin hydropower demand "covers" it's proportion of the instream flow demand
- Elkhorn Basin proportion is counted as "proportionate downstream demand"